Analysis of Traditional Pest Management Practices in Malawi: Case Study of Mbwadzulu EPA

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1. Introduction

Crop pests pose serious challenges to productivity and growth of the agricultural sector. Malawi's agriculture suffers from numerous pests, which cause significant losses of economic importance to crop production. It is estimated that large grain borers cause losses of 3-5% of the total attainable production over a period of 8 months; rice blast and brown spot diseases can cause a loss of up to 80% (Malawi Government, 2002). Over storage season, pests may cause losses of 4-5% for major crops, rice and maize (Greeley, 1986). This food loss is significantly costly to smallholder households. Thus, pest protection is necessary to boost food production and improve household food security.

Pest management in Malawi is a long history of almost exclusive use of chemical pesticides, although it is strongly advocated that chemical pesticides should be used only when it is difficult to control pests using alternative methods (Malawi Government, 2002). Although integrated pest management is a policy goal in Malawi, there is little commercially oriented work on alternative pest control methods. The policy emphasizes on integration of all pest control methods, developing resistant/tolerant crop varieties and livestock breeds, cultural control, biological control and chemical pesticides in a complementary manner that provides the most cost-effective control of pests and diseases of major crops and livestock in various farming systems through a multidisciplinary approach involving all stakeholders in agriculture, including farmers (Malawi Government, 1995). However, the policy is silent on how farmers' traditional knowledge base would be incorporated in the programs. The delivery system of agricultural extension still

emphasizes on chemical pest management. In Malawi chemical pesticides are predominantly used on high-value cash crops, grown by estate sector particularly, on tobacco (30%), coffee (21%), cotton (15%), and sugarcane (14%); maize (the staple food crop) uses only 2% of the chemical pesticides; smallholder farmers use only about 5% of the pesticides (Malawi Government, 2002). In smallholder agriculture, the bulk of pesticides are applied to crops with a high market value for the simple reason that it pays smallholders to protect them (Orr, 2003). Only very few smallholders who grow cash crops like tobacco and cotton, use pesticides. Poverty and land shortage restrict most smallholders from growing high-market value crops. More than 70% of smallholders in Malawi have less than 1 ha of farmland (Whiteside and Carr, 1997) and this comprises the poor majority who mainly grow maize for subsistence. About 66.5% of Malawi's rural population is poor (National Economic Council, 2000). This paper analyses pest management practices within the context of smallholder basic food crops.

2. Objective and study methodology

Based on findings from a field survey conducted in Mbwadzulu Extension Planning Area (EPA) in Mangochi District, southern Malawi in August-September 2002, the objective of this paper is to show the significance of local knowledge and traditional practices in pest management. Primary data were collected through oral interviews of randomly selected sample of 138 smallholder households using structured questionnaires and by observations. As a qualitative research, this survey used three kinds of purposive sampling strategies in a stepwise process: (1)

Stratified purposive sampling; (2) Maximum variation sampling; and (3) Purposive random sampling as outlined by Patton (2002). Research questions on pest management were: (i) how do farmers deal with pest problems on the farm? (ii) What are the major storage problems in the survey area and how do farmers overcome them?

3. Pest management in Mbwadzulu EPA

3.1 Management of field pests

Several methods are used to control pests on the farm. In Mbwadzulu EPA, this study found that only cotton and tobacco farmers representing 5.1% and 5.8% of the sample, respectively had used chemical pesticides such as Cypermethrin, Carbaryl (sevin) and Decis to control red spider mites, aphids, leaf eaters and elegant grasshoppers in cotton farm; they used fenitrothion and tabamex for controlling tobacco beetles and white flies. A close inquiry revealed that pesticides, which are used on tobacco and cotton, are delivered to farmers as an embedded extension package, which includes other inputs like seed and chemical fertilizer. In this case, it would be difficult to analyze the impact of “with” and “without” pesticide scenarios on the production of these two crops. Nevertheless, controlling pests using chemical pesticides is not always cost-effective and mostly lacks economic justification. As noted by Cheke and Tucker (1995), controlling outbreaks of African armyworms (*Spodoptera exempta*) was economically worthwhile only in areas of high productivity or where farmers grew high-value crops. In the case of Mbwadzulu EPA where very few farmers grow high value crops, it is not financially justifiable for pesticide traders to do business considering other costs like transport and communication. This study observed that farmers in Mbwadzulu EPA mainly depend on traditional pest control techniques.

Investigations on what farmers do when diseases such as head smuts in maize, and cassava mosaic virus attack their major food crops revealed that farmers “either uproot and burn the affected crops in order to prevent diseases from

spreading throughout the field or just abandon the crops if it is proven that nothing could be harvested”. Basically, smallholders in Mbwadzulu EPA use agronomic cultural practices such as weeding and burying the weeds and crop residues to reduce crop-weed competition for growth media and for pest control. Weeding is the most common practice of controlling field pests and all farmers in Mbwadzulu EPA practice it. Farmers also control grasshoppers, which are significant field pests, by physically killing them with sticks. Large wild animals like monkeys, elephants, wild pigs and birds are controlled by “using scare crows, ringing bells, lighting fire at night and setting traps or digging pits around farm borders for animals to fall in.

3.2 Management of storage pests

Table 1 presents a summary of major storage problems in Mbwadzulu EPA. A combination of weevils, rodents (rats) and ants are the major storage problem affecting 79.7% of the sample. Exclusively, weevils are the commonest storage problem. Weevils cause considerable damage to grains especially, maize, beans and peas. Rodents damage crops starting from planting time during which they eat up planted grains. This reduces plant germination and seedling emergence and results in the costly replanting of the farm. In storage, rodents destroy storage materials such as sacks and spoil the grain with urine and fecal matter in addition to consuming the stored grains. Like rodents, ants also attack field crops, causing lodging by cutting crop roots then eating whole plant. In storage, ants destroy sacks and eat up crops. In terms of estimated loss of food, it was learned that “if left uncontrolled, a combination of weevils, rodents and ants could potentially destroy more than 2 bags (about 100 kg) of stored maize grain in less than two months.” In 2002, the sampled smallholders had produced a total of 133.339 tons, ME of basic foodstuffs (Maonga and Maharjan, 2003). This implies that if the affected 79.7% of the sample did not protect their crops, they would lose about 11,000 kg, (110 households $\times$ 100 kg) or 8.2% loss.

Table 1 Major crop storage problems by landholding in Mbwadzulu EPA

Storage problems	Landholding categories					Totals	
	<0.5 ha	0.5-1.0 ha	1.1-2.0 ha	2.1-3.0 ha	>3.0 ha	Farmers	(%)
Damage by weevils, rodents and ants	3	41	49	12	5	110	79.7
Lack of money for storage tools*	1	5	9	—	—	15	10.9
Unavailability of storage tools	—	7	1	1	—	9	6.5
Labour bottlenecks	—	—	2	—	2	4	2.9
Totals	4	53	61	13	7	138	100.0

Source: Field survey (2002)

Note*: Storage tools include chemical pesticides, bags/sacks and containers.

Lack of money for purchasing storage tools was a second major storage problem followed by unavailability of storage tools and pesticides. The basic reason for the lack of modern storage tools and pesticides in Mbwadzulu EPA is mainly because traders in these storage facilities do not find real financial justification since most smallholders grow low value subsistence crops. Labour shortage was another significant storage problem. Shortage of labour to construct granaries can lead to delayed harvesting and crop damage and this can negatively affect household food sufficiency. This problem was common in female-headed households with young children who could not assist with the workload and in households where the male head lived outside the community because of employment or polygamous reasons.

Inquiries on management of storage pests produced an array of techniques. It was found that in the absence of modern storage tools, smallholders use traditional equipments mainly hand-woven granaries made from local resources like trees, twigs, bamboos, and reeds. Other common storage tools included head-baskets (*madengu*), big pots and leaf-baskets (*zikwatu*), mainly for storing dried vegetables for future use, thereby spreading household nutrition over a longer period in a year. Leaf-baskets are also used for storing seed for next planting by hanging them under the kitchen roof. Farmers hang stored crops in the kitchen because "the smoke and soot produced during cooking protect the crops from insect pest attack." Table 2 presents the findings on management of weevils, rodents and ants. The study found that 37% of the

sample use chemical pesticides especially, *Actellic* dust for controlling weevils and ants, and *rat poison* for killing rodents. However, it was observed that most of these chemical pesticides were those found in small quantities of 5-10g packets and mainly used for storing seed for the next planting. Realistically, chemical pesticides are not significantly used in pest management in Mbwadzulu EPA. About 33.2% of the sampled households use traditional methods such as mixing crops with ashes to avoid pests and rotting (15.2%); boil *Neem* (*Azadirachta indica*) tree leaves and other bitter wild fruits/leaves, dry them together with the seed, soak the bags in the concoction or spray the concoction on the crops before storing (10.1%); put bags on raised stones (6.5%); dry and store crops in pots (1.4%). Some farmers "mix the shelled grains with a mixture of dry chili pepper (*Capsicum spp.*) and ash before storing in bags or pots." About 5.1% of the sample use "multiple techniques: chemical pesticides, *ash*, *Neem* concoctions and keeping cats to catch the rats. This is an integrated pest management technique.

4. Discussion

Smallholder farmers use multiple methods to overcome pest problems within their socio-economic capability. The predominant cultural practices of weeding offer double impacts, controlling pests as well as contributing to soil improvements on the farm. The buried plant materials turn into humus after decomposition while those laid between ridges on the surface help to control soil erosion by reducing run-off

Table 2 Smallholder pest management techniques by landholding in Mbwadzulu EPA

Pest management techniques	Landholding categories					Totals	
	<0.5 ha	0.5-1.0 ha	1.1-2.0 ha	2.1-3.0 ha	>3.0 ha	Farmers	(%)
Use <i>Actellic</i> chemical to kill weevils in grains, and <i>rat poison</i> to kill rodents	1	12	30	4	4	51	37.0
Mix crops with ashes to avoid pests and rotting	1	8	10	2	—	21	15.2
Boil <i>Neem</i> leaves and soak bags in the concoction or spray concoction on grain crops	2	6	4	2	—	14	10.1
Put bags of stored crops on raised stones to prevent ants	—	5	3	1	—	9	6.5
Dry grain crops and store in big pots	—	1	1	—	—	2	1.4
Multiple techniques: chemical pesticides, ash, <i>Neem</i> concoction and cats	—	2	2	3	—	7	5.1
"We have no any real solution"	—	19	11	1	3	34	24.6
Totals	4	53	61	13	7	138	100.0

Source: Field survey (2002)

during rainy season. Crop residues on the surface reduce both water and wind erosion (Troeh, et. al, 1999). Most traditional methods are reliable and serve farmers significantly within the local context without seriously threatening them and the agricultural environment. Such methods help farmers to control crop damage by pests and avoid catastrophe on household food situation. It has been shown that through traditional pest management practices farmers could save 8.2% of food loss in storage by weevils, rats and ants. In addition, traditional storage pest management practices use readily available and affordable resources by the majority of smallholders and are therefore, cost-effective to most resource poor farmers. This local knowledge can help to enhance adoption of hybrid and high market value crop varieties and thus contribute to improved smallholder production and socio-economic status. Plant concoctions like *Neem* tree for example, are easy to administer, environmentally friendly and do not involve any financial cost.¹⁾ *Neem* tree leaves are highly biodegradable and decompose easily into manure and therefore, do not pose any threats to the environment. This study has also shown that 5.1% of the sampled households uses what can be described as integrated pest management techniques. The Government can review such strategies and give policy consideration.

Although traditional knowledge based practices offer positive contributions to smallholder farmers, evidence shows that they cannot solve all the pest problems affecting smallholders. Despite being in the same agro-ecological zone, some farmers in Mbwadzulu EPA lack the knowledge of traditional pest management techniques. **Table 2** has shown that 24.6% of the sample did not have any real storage pest management technique. This reveals knowledge gaps between groups of farmers, implying faulty distribution of traditional knowledge capacity amongst them. Indigenous technical knowledge and innovation capacity tend to be unevenly distributed within and across communities (Chanbers, et. al., 1989). This means there is need to fill this gap with external support. Such support is necessary to strengthen traditional practices and to promote integrated pest management practices. In order to achieve this goal, the onus falls on the effective agricultural extension. Agricultural extension should move beyond delivery functions to perform facilitating roles, working with not only progressive farmers but also with the majority of the poor smallholders. In order to improve knowledge sharing among smallholders and expand the coverage of integrated pest management programs, agricultural extension in consultation with local leadership should help in mobilizing and encouraging farmers to form networking groups,

acquire appropriate external technologies and its expeditious flow between and amongst farmers. Such groups can work as focal points where farmers can exchange knowledge through plenary monthly discussion forums, farm tours and field visits. Member-driven networks can be very effective because farmers can easily understand local technologies within their context. This will enable smallholders to participate more actively in integrated pest management programs. In order to ensure continuity and sustainability of such programs, external technologies must be adaptable to local agro-ecosystems and fall within socio-economic capacity of smallholders who suffer most when these technologies fail. Without positively appraising any specific pest management strategies, this paper asserts that the balance between potential strengths and weaknesses should be fully analyzed in order to identify significant gaps. Relative strengths and weaknesses of external scientific technologies and traditional practices should be assessed to see how the strengths may be incorporated and the weaknesses sidelined.

5. Conclusion

Traditional pest management practices have potential to save crops from pest damage which if not controlled could cause significant losses to household food security. The Malawi Government advocates integrated pest management, calling for diversity of pest control methods and practices, and involving farmers. This is a positive step. However, farmers must be allowed to participate fully as equal partners with professional experts in technology generation and dissemination for the success of integrated pest management programs. Recognizing traditional pest management practices as contributory to the knowledge base of pest management may help to induce cost-effectiveness and sustainability of government supported programs. Institutionalizing traditional pest management practices within policy framework will help to strengthen smallholder efforts.

Note

- 1) In Kenya, Duveskog, et al, (2002) found that through traditional knowledge and practices, farmers developed a cheap and harmless local bio-pesticide through a concoction of dried chili peppers, *Neem* tree leaves and local *Aloe* to control insects and other pests. In India, farmers have been using extracts from *Neem* tree to control insect pests and to treat livestock (Gorjestani, 2000).

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Acknowledgements

We appreciate the support of Ronald Chilumpha, Steven Kazembe and the staff of Machinga ADD.